

# On Three New Chromodoridinae from Australia (Opisthobranchia: Nudibranchia)

BY

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(8 Text figures)

## INTRODUCTION

SPECIES OF THE DORIDACEAN subfamily Chromodoridinae are especially common in Australian seas. The species described below are only three of innumerable new species and new records recognized but not reported from Australia. These latter species will be treated in other studies.

The material examined for this research has been deposited in either the National Museum of Victoria, Melbourne (N.M.V.) or the Australian Museum, Sydney (A.M.), depending upon the state of origin. Unless otherwise stated, all material has been collected by the writer.

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## NUDIBRANCHIA

### Doridacea

#### EUDORIDACEA

#### CRYPTOBRANCHIA

#### DORIDIDAE

#### Chromodoridinae

*Hypselodoris kulonba* BURN, spec. nov.  
(Figures 1 to 4)

Type locality: Pool in shore platform, Point Lonsdale, Victoria, 144° 37' East, 38° 18' South

Material: 8 October 1961, 1 specimen (Holotype), N. M. V. reg. no. F22 717; 24 October 1964, 1 specimen (Paratype), N. M. V. reg. no. F25 651; 21 December 1964, 1 specimen (Paratype), N. M. V. reg. no. F25 652.

**Description:** The largest specimen when alive was about 30 mm long and 10 mm broad; preserved it is 13 mm long, 8 mm broad across the dorsum, the foot is 4.5 mm at its widest, the tail (10 to 12 mm long in life) is now 3 mm long, the body height is 7 mm. Alive, the colours were pure white with the foot and dorsum edged in lemon yellow inside which is a narrow opaque band. *Chromodoris aureomarginata* CHEESEMAN, 1881 (p. 223) from New Zealand is similarly coloured with the exception that the outline is broader and of a heavy orange.

The body shape (Figure 1) is typically "glossodoridi-



Figure 1

*Hypselodoris kulonba* BURN, spec. nov.  
Dorsal view of holotype, alive.

form" with a high section, a very narrow dorsal overhang, and short digitiform oral tentacles ventrally shallowly grooved at their ends. The rhinophores have about 12 oblique laminae upon the clavus; the branchiae are simply pinnate and 10 in number. The tail which in life extends far behind the posterior dorsum is narrow and pointed. The margin of the dorsum has a number of large white glands visible within it, particularly in the posterior part. These (Figure 2, z) consist of compound flask-shaped

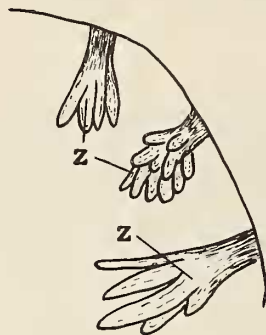


Figure 2

*Hypselodoris kulonba* BURN, spec. nov.

Mantle edge glands.

z - mantle edge glands

glandulae, varying in number from four to twelve, all emptying into and discharging through a common duct. Considerable disparity of length is apparent from one gland to the next, the longest is about 1.5 mm. The anterior margin of the foot is bilabiate, the upper lip medianly grooved.

The buccal mass is 2.3 mm long; the ribbon-like salivary glands have a similar length and are 1 mm broad; they originate from the upper sides at the third quarter. The nervous system concentrated around the oesophagus is very large but was not examined. The labial armature ("grasping ring," MARCUS, 1955: 125) is very narrow and as in *Glossodoris neona* (l.c., pl. 10, fig 94) it is broken dorsally. The armature consists of minute simple bifid rodlets set end on. The colourless 1.5 mm long radula has the formula  $46 \times 40 \cdot 0 \cdot 40$ . The bare rhachis is wide. The first lateral tooth (Figure 3, 1) is smaller and more squat than the succeeding teeth which have a long stout cusp (Figure 3, 4). The teeth increase in size to the sixth or eighth from the margin (30-34) beyond which they

decrease slightly. All teeth are bifid, with no apparent great difference in the shape of the tip from rhachis to margin.

The genital organs (Figure 4) have the female glandular mass swollen and the seminal vesicles filled. The

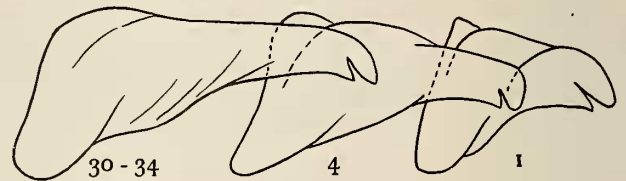


Figure 3

*Hypselodoris kulonba* BURN, spec. nov.

Radular teeth.

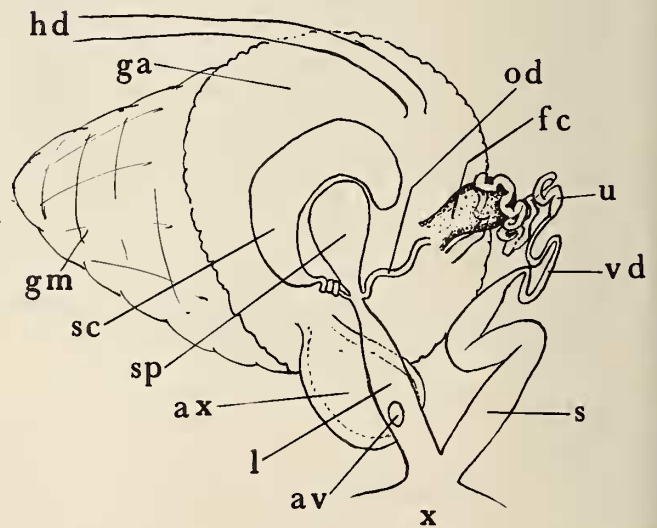


Figure 4

*Hypselodoris kulonba* BURN, spec. nov.

Reproductive organs.

- |  |                         |
|--|-------------------------|
| av - oviduct, vaginal opening            | ax - oviduct            |
| fc - fertilizing chamber                 | ga - albumen gland      |
| gm - mucus gland                         | hd - hermaphrodite duct |
| l - vagina                               | od - uterine duct       |
| s - penial sheath                        | sc - spermatocyst       |
| sp - spermatheca                         | vd - vas deferens       |
| u - prostatic part of male efferent duct |                         |
| x - common genital atrium                |                         |

flat broad hermaphrodite duct (hd) is straight and long, no appreciable ampulla is evident before the duct curves down into the pink spherical albumen gland (ga) which lies nestled in the anterior ventral side of the white triangular mucus gland (gm). Some short distance below the hermaphrodite duct, an elongate lobiform fertilizing chamber (fc), very much larger than in *Chromodoris neona* (MARCUS, 1957: 420, fig. 71, w), protrudes from the albumen gland. At the ventral base of this, the male efferent duct originates in a short dilation, constricted distally. The long twisted prostatic portion (u) winds around the dorsal and posterior sides of the fertilizing chamber and continues onwards for a short way beyond. The prostatic part is very soft and flabby, white in colour. Unlike *Chromodoris ameona* (ODHNER, 1934: 250-251, fig. 15) and *C. punctilucens* (ODHNER, 1932: 34-35, fig. 5) with a narrow sharply twisted, very long prostatic part or *Hypselodoris saintvincentius* BURN, 1962 (152, fig. 1) and *H. edenticulata* WHITE, 1952 (113-114, fig. 15) with a relatively straight prostatic part, *C. neona* MARCUS and the new species have the prostatic part sectionally larger than the vas deferens (vd). *Hypselodoris edenticulata* and *H. runcinata* (WHITE, 1951: 244-245, fig. 9), both congeneric with the new species in the shape of their radular teeth, also have the prostatic part larger than the vas deferens. The vas deferens (vd) is very slender and muscular throughout its short winding course before it dilates into the much longer and stouter double-bent penial sheath (s). The common genital atrium (x) receives the penial sheath just inside its aperture on the anterior side.

The female organs receive and discharge through a duct which opens into the posterior side of the common genital atrium. A short distance from the atrium the duct divides into a posterior obliquely entering oviduct (ax) and the straight vagina (1). The vagina is wide and of reasonable length; the upper part is tapered and opens directly into the smallish elongate spherical spermatheca (sp). To the left is the narrow, three whorled duct leading to the flattened, very large, curved spermatocyst (sc). From the right the muscular uterine duct (od) leaves and courses to the near-by posterior base of the fertilizing chamber. The oviduct is exceptionally developed, with thick walls and a voluminous lumen; its aperture (av) to the vagina is small and controlled by a strong sphincter muscle.

**Discussion:** Four species with bicuspid radular teeth (*Hypselodoris* STIMPSON, 1855: 388; ODHNER, 1957: 252) are already known in Australia. Three are blue species: *H. obscura* STIMPSON, 1855 (388; = *Goniodoris crossei* ANGAS, 1864: 54, pl. 5, fig. 1; BERGH, 1884a: 648-650; = *Chromodoris runcinata* BERGH, 1877: 479 to

481, pl. 51, figs. 32, 33; pl. 53, figs. 5-12; 1884b: 76-78, pl. 6, figs. 1-4) from New South Wales; *H. saintvincentius* BURN (1962: 151-152, pl. 1, figs. 1-2, text figs. 1-2) from South Australia and a closely allied species to the first; and *H. festiva* (ADAMS, 1861; BABA, 1949: 51, 142, pl. 18, fig. 63, text fig. 56) from Queensland and northern New South Wales; each has yellow spotting over its body colour, the radular teeth prominently bicuspid, and in the first and second species at least, a short relatively straight male efferent duct. The fourth species, the pink *H. arbuta* (BURN, 1961: 55-56, pl. 15, figs. 1, 2) from Victoria, has a series of yellow patches along each side of the dorsum and the radular teeth with longer slender cusps. The New Zealand *Chromodoris aureomarginata* CHEESEMAN, 1881 (223), so similar externally to the new species, has a rhachidian tooth and denticulate teeth in the radula (ELIOT, 1907: 346) to distinguish it from the new species. Other species of white body colour extracted from "*Glossodoris*" (PRUVOT-FOL, 1951) plus *G. nona* BABA, 1953 (208, figs. 2, 6F, 6G) differ from *H. kulonba* by their denticulate radular teeth.

The specific name *kulonba* is taken directly from the dialect of the Badjelang aborigines of northern New South Wales; it describes the predominantly white bird, the ibis.

*Noumea cameroni* BURN, spec. nov.  
(Figures 5 and 6)

*Glossodoris* spec., ALLAN, 1947: 445

**Type locality:** Pool, Angourie, Clarence River, northern New South Wales, 153° 20' East, 29° 30' South.

**Material:** 5 June 1941, 1 specimen (Holotype) collected by Joyce Allan and A. A. Cameron, A.M. reg. no. C. 62846. ALLAN (*l. c.*) records three specimens as having been collected; of these only one, apparently the largest, could be traced.

**Further record:** Minnie Waters, east of Grafton, northern New South Wales, January 1963, 1 specimen collected and photographed in colour by Mr. Geoff. Biddle.

**Description:** Alive the largest specimen measured 15 mm in length; preserved the single specimen is 6 mm long, 2 mm broad and 2.5 mm high. The foot is 1.5 mm at its widest, the contracted tail is about 1 mm long. Now uniformly dull brown, the living animal was rose-pink with darker rose spots upon the dorsum, sides and undersurface of the foot. The dorsum was bordered marginally with a vermilion band inside which was firstly an orange line and secondly a trace of a white line. The rhinophores and ten branchiae were light pinky-yellow (ALLAN, *l. c.*).

The body (Figure 5) is typical of the Chromodoridinae with high sides, very narrow dorsal overhang, and short digitiform oral tentacles (h). The rhinophores and branchiae are completely retracted; the genital pore (x) is prominent, and the long tail is narrowly rounded.

The slender labial armature is far stronger than in either *Chromodoris* or *Hypselodoris*, but as in those genera the armature is broken dorsally; it is composed

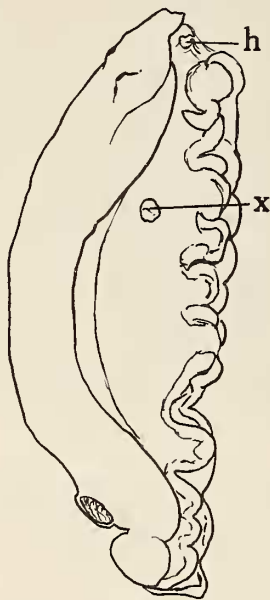


Figure 5

*Noumea cameroni* BURN, spec. nov.

Right lateral view of preserved holotype.

h - oral tentacles

x - genital apertures

of bifid curved elements set obliquely. The yellow, 0.5 mm long radula (Figure 6) has the formula  $32 \times 20 \cdot 1 \cdot 0 \cdot 1 \cdot 20$ . The narrow bare rhachis is bordered on each side by a large obliquely shaped lateral tooth (lat) which has a long slender cusp bearing on the inner edge two small denticles and on the outer edge one denticle. The marginals, first five large, remainder becoming smaller marginally, are erect narrow teeth with a curled over cusp bearing one denticle on the outer side.

The genital organs are too decayed for detailed study. The muscular penial sheath is surmounted by a narrow efferent duct. Below the penial sheath, a muscular atrium bends at right angles before opening externally.

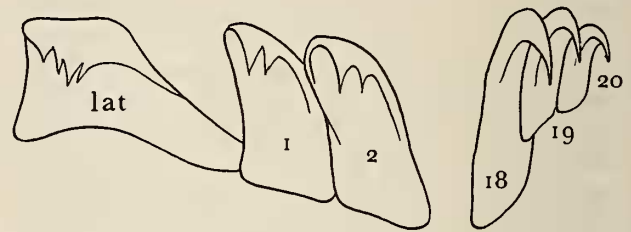


Figure 6

*Noumea cameroni* BURN, spec. nov.

Radular teeth.

**Discussion:** This species is dedicated to Alex Cameron, of Harwood Island, Clarence River, New South Wales, a keen collector of opisthobranchs and other marine life.

*Noumea* RISBEC, 1928 (p. 165; 1953, p. 85) is a small genus of generally small species of Chromodoridinae, the chief characteristic of which is the very large obliquely shaped lateral tooth on each side of the bare rhachis. The type species, *N. romeri* RISBEC, 1928 (165-167, pl. 5, fig. 5, text fig. 48; 1953: 85-86, figs. 44-45) is a 4 to 5.5 mm long pale rose coloured slug with a white border around the dorsum, and six branchiae. The larger size, the differently coloured dorsal margin plus the darker spotting, the ten branchiae, and especially the greater number of teeth in each half row of the radula (one lateral and twelve marginals in *N. romeri*) distinguish the new species. Other species of *Noumea* can be separated from *N. cameroni* by the characteristics listed below.

*Noumea decussata* RISBEC, 1928 (167-169, pl. 8, fig. 6, text fig. 49; 1953: 86-89, figs. 43, 46; PRUVOT-FOL, 1951: 96). Pure white with minute yellow spots, rhinophores and branchiae reddish. Radular formula  $28 \times 13 \cdot 1 \cdot 0 \cdot 1 \cdot 13$ , marginals with very short bases and elongate denticulate cusps.

*Noumea flava* (ELIOT, 1904; RISBEC, 1928: 169-171, pl. 6, fig. 7, text fig. 50; 1953: 89, fig. 47; PRUVOT-FOL, 1951: 104). Yellow with a red border, rhinophores and branchiae yellow. Radular formula  $40 \times 19 \cdot 1 \cdot 0 \cdot 1 \cdot 19$ , lateral tooth with a blunt cusp and four denticles on the inner side.

*Noumea nivalis* BABA, 1937 (1949: 54, 144, pl. 19, fig. 68, text fig. 61; PRUVOT-FOL, 1951: 126). Pure white with an orange border; rhinophores and branchiae red or orange. Radula  $30 - 35 \times 24 - 32 \cdot 1 \cdot 0 \cdot 1 \cdot 24 - 32$ , lateral tooth

with one denticle on inner side, 2-3 denticles on outer side, marginals with 3-5 denticles on outer side.

*Noumea parva* BABA, 1949 (54, 144, pl. 19, fig. 69, text fig. 62). Very small (2 mm long), purplish brown with darker chocolate spots on the dorsum, rhinophores and branchiae purplish red. Radula  $25 \times 6.8 \cdot 1.0 \cdot 1.6-8$ , lateral with two denticles on outside of the broad cusp, marginals with two to four denticles.

*Noumea purpurea* BABA, 1949 (55, 144-145, pl. 19, fig. 70, text fig. 63). Purplish red with a white mid-dorsal line from rhinophores to branchiae, rhinophores and branchiae vermilion. Radula  $45 \times 16.17 \cdot 1.0 \cdot 1.16-17$ , lateral tooth with 2-3 denticles on each side of cusp, marginals with 3-5 denticles.

*Noumea violacea* RISBEC, 1930 (1953: 90, fig. 48). Purple in colour, paler ventrally. Radula  $20 \times 8 \cdot 1.0 \cdot 1.8$ , lateral with one denticle on outer side, marginals with a series of pectinate denticles.

*Noumea margaretae* BURN, spec. nov.  
(Figures 7, 8)

**Type locality:** Portsea Pier, Port Phillip Bay, Victoria,  $144^{\circ} 43'$  East,  $38^{\circ} 19'$  South.

**Material:** 27 March 1960, 3 specimens collected by Miss J. Hope Macpherson and party, N.M.V. nos. F22719 (Holotype) and F21231 (2 Paratypes), together with a series of colour slides of the same number. Point Lonsdale, Port Phillip Heads, Victoria, 26 December 1962, 2 specimens under stone in rock pool on north side of rock platform, N.M.V. no. F22720; 21 December 1964, 1 specimen, N.M.V. reg. no. F25653.

**Description:** The largest specimen (Holotype) is now a severely contracted slug measuring 5.5 mm long, 2.7 mm broad and 2.2 mm high. The larger Paratype is 4 mm long, the smaller 3.5 mm. Alive, the species barely attains 10 mm; the colour is palest pink on the sides of the body and foot; the dorsum is pink, darker in the mid-line and bordered by a narrow band of white which along its edge may or may not have an extremely narrow broken line of red. Sparsely scattered over the dorsum are medium sized red or orange spots, generally in four or five transverse areas, with one or two spots behind the branchiae and a couple more upon the tail. The rhinophores are cream with distinctive orange tips; the branchiae are orange-suffused pink.

The body (Figure 7) is typically elongate oval in life and resembles most other pale smooth Chromodoridinae. The dorsum extends laterally beyond the body only very briefly. The foot is thickened anteriorly as usual; the

rhinophores have six to eight laminae; the branchiae number five or six.

The labial armature is similar to that of *Noumea cameroni*, being strong, very slender but divided both



Figure 7

*Noumea margaretae* BURN, spec. nov.  
Dorsal view of holotype, alive.

dorsally and ventrally in contradiction to that species and forming a pair of jaw panels composed of U-shaped elements. The formula of the 0.5 mm long palest yellow radula (Figure 8) is  $23 \times 12 \cdot 1.0 \cdot 1.12$ . The lateral tooth is more triangular than in *N. cameroni* and has a long slender cusp bearing a single denticle on the outer side as in *N. violacea* RISBEC, 1953 (90, fig. 48). The first and second marginal teeth are also somewhat triangular with an attenuated upper part, again with a slender cusp and one outer-side denticle. The remaining ten marginals are all slender erect teeth, firstly short cusps which lengthen to the third from the last and then diminish in the last two.

**Discussion:** *Noumea romeri* RISBEC, 1928 (105-107, pl. 5, fig. 5, text fig. 48) approaches nearest to the new species but is separated from it by the lack of orange spots upon the dorsum, the carmine rhinophores and branchiae, and the number of denticles on the lateral radular tooth. Both species are pinkish with a white border, have five or

six branchiae and 12 marginal teeth. The other pink species of *Noumea*, *N. cameroni* spec. nov., has a vermilion border, red spots upon the dorsum, ten branchiae, and a longer radula with more teeth (1 plus 20) per half row.

Other pink or red Chromodoridinae from Australia are *Hypselodoris arbuta* (BURN, 1961: 55-56, pl. 15, figs. 1,

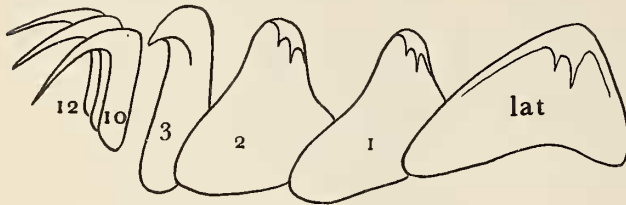


Figure 8

*Noumea margaretae* BURN, spec. nov.  
Radular teeth.

2) where radular teeth are not differentiated from margin to margin, and *Chromodoris haliclona* (BURN, 1959: 17, pl. 3, fig. 3; 1961: 56, pl. 15, fig. 5) which has the teeth denticulate on both sides.

This species is dedicated to my wife, Margaret, a very able collector of the smaller opisthobranchs. By this record, a further genus is added to the Victorian marine fauna and a second species of the genus to the Australian list.

## SUMMARY

Three new species of Doridacea Chromodoridinae are described from Eastern Australia: *Hypselodoris kulonba*, *Noumea cameroni* and *N. margaretae*. *Noumea* is a new generic record for the continent.

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## An Eastern American Freshwater Mussel, *Anodonta*, Introduced into Arizona

BY

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(Plate 28)

IN STUDYING the freshwater mussels (Unionidae) in the collection of the California Academy of Sciences, San Francisco, I noticed three conspicuously different specimens among the western American *Anodonta*. Though evidently juvenile, they showed inflated beaks and double-looped beak-sculpture with nodes on the postero-ventral angles of the loops. These features showed that the species belongs to the subgenus *Pyganodon* (native only in North America east of the continental divide), whereas the few western American forms belong to *Anodonta* (s. s.) and have flatter beaks with more subdued sculpture. Through the courtesy of Leo G. Hertlein and Allyn G. Smith of the Academy, I was able to bring the shells to the University of Michigan and obtain a more precise identification from Henry van der Schalie of the Museum of Zoology. These specimens are significant not simply in documenting another species in the Pacific Coast drainage, but in

showing the difficulties of establishing a mussel outside the area of its native range.

The three specimens are paired valves, all collected recently dead, now catalogued as California Academy of Sciences 38846. They were collected in Lake Mary, T. 20 N., R. 8 E., Coconino County, Arizona, about ten miles southeast of Flagstaff, by A. G. Smith, 11-IV-1955. The lake is a long, narrow, shallow body of water that is partly the result of artificial dams; it is subject to seasonal fluctuation that had left the *Anodonta* stranded. Whether the species still lives in the area is not known. Smith recognized the clams were worth special search but could find only three. Measurements of the specimens (in millimeters) follow:

Specimen	Length	Width	Height
1	33	11	20
2	25	10	16
3	20	7	12

<sup>1</sup> Contribution No. 5, Western American Freshwater Mollusks Program, Institute of Malacology.